ECE-320 Linear Control Systems
Spring 2005

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Text: There is no single textbook that works for all topics. For most of the topics we cover, I will put some notes on the class website. These notes are distinct from the notes I will be using in class and generally will have different examples than those I use in class. However, these notes are not complete yet.

GRADING POLICY
(Spring Graduating Seniors Only)

Each Exam	25% each
Labs	25%
Homework/Matlab/Simulink	15%
Quizes	10%

(All Others)

Midterm Exam	20%
Final Exam	30%
Labs	25%
Homework/Matlab/Simulink	15%
Quizes	10%

Notes:
(1) You must have a passing average (greater than or equal to 60%) on the exams to pass the class!
(2) Homework assignments are ***due at 10:00 AM on Tuesday***. No late homework will be accepted without prior approval.
(3) You must acceptably complete each lab to pass the class.
(4) For the majority of the labs, you will be required in the preceding homework to derive some relationships we will be using in lab or simulate a system (or systems) . If you understand the homework the lab should not be a problem.You will be told which parts of the homework are required for the lab. You will receive a 0 on the corresponding lab if you have not done this acceptably! However, you must still complete the homework and do the lab to pass the course.
 (5) Many of the homework problems will require you to use Matlab or Simulink as part of the problem. If you do not do these parts of the problem, you will receive no credit for any parts of the problem.
(6) You are expected to do your own work. You can certainly talk with each other and help each other, but the work you hand in should be your own. As an example, if two people hand in the same Simulink plot and both came from the same directory, neither will receive any points!
 (7) Unless specifically told otherwise on a particular problem, you cannot turn in any Maple code or plot as part of the solution to a problem.

Labs:
1) You will work in groups of two.
2) **<u>Your lab must be printed out before coming to lab each week</u>**. I reserve the right to deduct half of the lab points if you don't have your lab printed out at the time the bell rings. There are no prelabs (except for homework problems), so this is not all that much to ask. The printer in C-116 hardly ever works, so don't depend on it!
3) You need to read the lab before you come to lab. If you read through the lab you will (hopefully) get the *big picture* and understand what we are trying to do. If you just blindly follow the steps in the lab with no thought as to where you are going, you will get little from the labs.
4) You must write a short memo summarizing your results. This memo is due before your next lab period.. You should include **<u>as attachments</u>** in the memo the plots and you made for the lab. The lab write up is generally to be computer generated and each graph needs to be labeled as a figure (with a caption). Usually students find it easier to just copy and paste all the figures they need into a document and explain the figure or answer questions as they are doing the lab.

SYLLABUS

Lab 1 - Matlab, Simulink, the ECP systems
Class 1 (3/7) - Laplace Transforms/Partial Fractions
Class 2 (3/9) – Laplace Transforms/Partial Fractions
Class 3 (3/11) – Laplace Transforms, Final Value Theorem

Lab 2 – Log Decrement and Step Response for System Identification
Class 4 (3/14) – Position and Velocity Errors
Class 5 (3/16) - Response of 2nd Order Systems, Performance Specifications
 Class 6 (3/18) - Characteristic Polynomial and Modes, Stability

Lab 3 - Time and Frequency Domain System Identification (two 1 dof systems)
Class 7 (3/21) – Block Diagram Manipulation
Class 8 (3/23) – Model Matching (ITAE, Deadbeat)
Class 9 (3/25) - Quadratic Optimal Systems

Lab 4 – Time and Frequency Domain System Identification (one 2 dof system)
Class 10 (3/28) – Quadratic Optimal Systems
Class 11 (3/30) – Steady State Errors, System Type
Class 12 (4/1) – The Root Locus

Spring Break

Lab 5 – ITAE, Deadbeat, and Quadratic Optimal Systems
Class 13 (4/11) – Root Locus for Compensator Design
Class 14 (4/13) -- Root Locus for Compensator Design
Class 15 (4/15) – ***Exam 1***

Lab 6 – Root Locus Design (Matlab's sisotool)
Class 16 (4/18) – Lag Compensators
Class 17 (4/20) - Coefficient Matching - Diophantine Equations
Class 18 (4/22) – Coefficient Matching - Diophantine Equations

Lab 7 – Root Locus Design
Class 19 (4/25) - Coefficient Matching - Diophantine Equations
Class 20 (4/27) – System Sensitivity
Class 21 (4/29) – State Variable Systems

Lab 8 – Coefficient Matching- Diophantine Equations
Class 22 (5/2) – State Variable Systems
Class 23 (5/4) – Pole Placement for State Variable Feedback
Class 24 (5/6) – Pole Placement for State Variable Feedback

Lab 9 – State variable control for 1 and 2 degree of freedom systems
Class 25 (5/9) - Bode Plots, Phase and Gain Margins
Class 26 (5/11) - Bode Plots, Phase Lead Compensators
Class 27 (5/13) - Bode Plots, Phase Lead Compensators

Lab 10 - Controlling an Inverted Pendulum
Class 28 (5/16) - Linearization
Class 29 (5/18) - Linearization
Class 30 (5/20) **- *Exam 2*** *(Spring Graduating Seniors)*